UNC Charlotte - MakerSpace

E-sewing

Basic Setup Guide

SparkFun
3-20-2017

What Are Sewable Electronics?

Sewable electronics combine traditional craft processes (sewing, fashion design, and textile design) with electrical engineering, computer science, and hardware skills.

With sewable electronics, you can create e-textiles (electronic textiles), which are often wearable, flexible projects that look less like traditional electronics and more like craft and art projects. Many e-textile projects replace wiring with flexible conductive materials such as conductive thread and fabric. For the projects in this guide, we will be sewing circuits together with conductive thread.

The Basics

This tutorial is designed to help the absolute beginner get going with E-textiles. E-textiles is an exciting, new field of electronics that combines embedded electronics with fabric and textiles. These wearable electronics are gaining lots of attention and are becoming more accessible to the non-technical crowd by the day. This tutorial assumes you have absolutely no previous experience with e-textiles.

What is LilyPad?

The LilyPad system is a set of sewable electronic pieces designed to help you build soft, sewable, interactive e-textile projects. Using LilyPad pieces is a great way to experiment with electronics through the lens of crafting. Each LilyPad piece has large conductive sew tabs for easy sewing and a rounded shape so as not to snag fabric or cut thread. Various input, output, power, and sensor boards are available. They're even washable!

LilyPad boards make it easy to add life to your wearables with an assortment of sensors, LEDs, buzzers, and many other input and output devices. Incorporating a microcontroller give you total control over the look and behavior of your project!

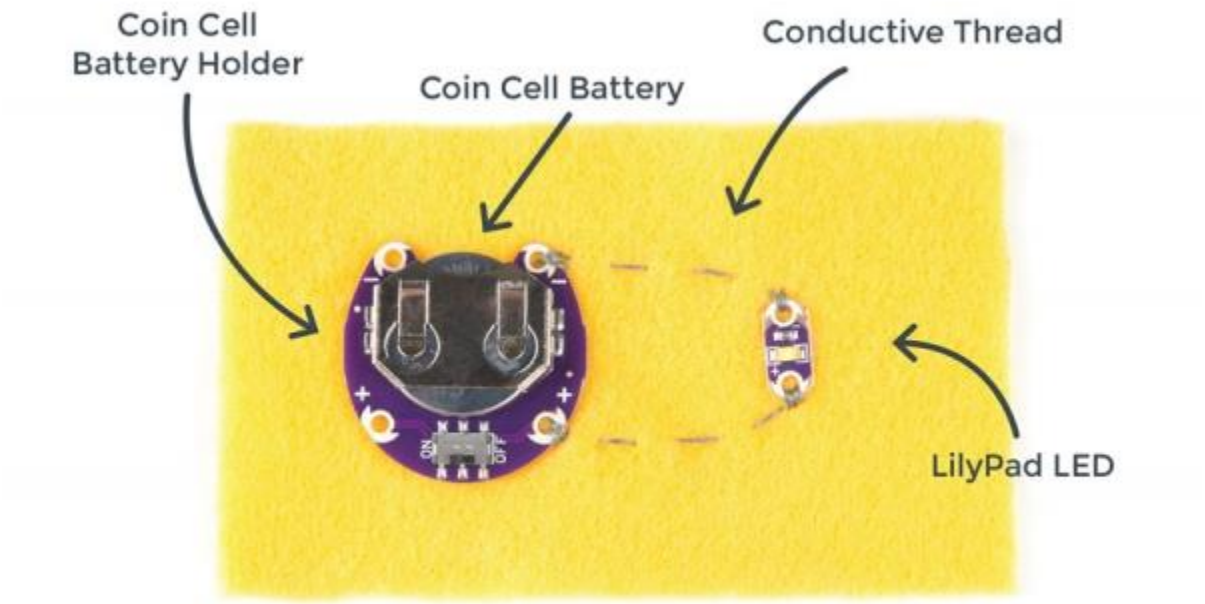
For a more comprehensive list of LilyPad Arduino boards, please check out our comparison guide.

What Is Conductive Thread?

Conductive Thread is a specialty thread made with stainless steel fibers. It can be used instead of copper wiring to connect LilyPad (or other e-textile) pieces together to create circuits.

Sewing with Conductive Thread

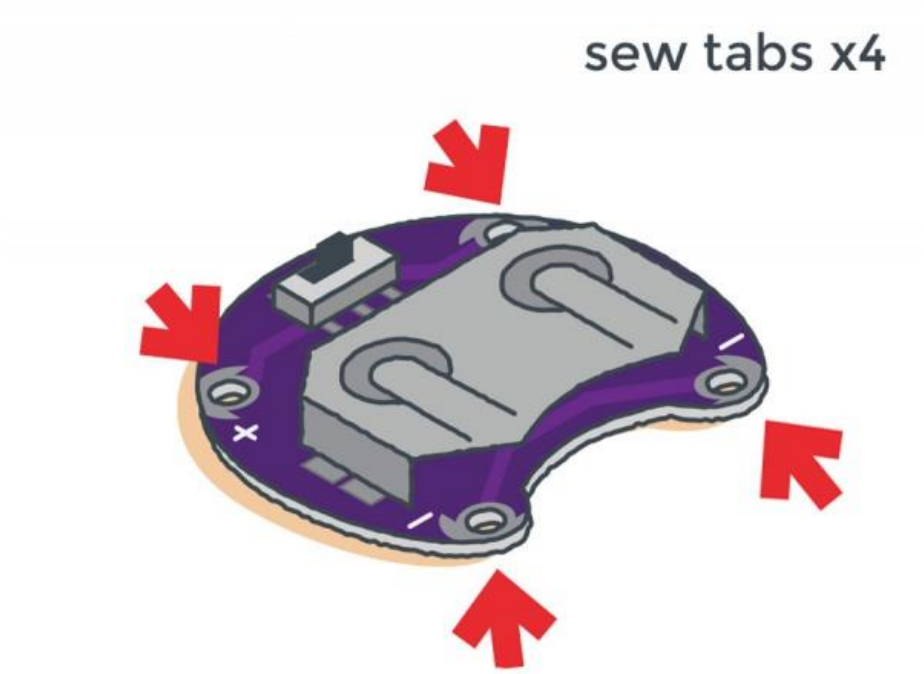
Most LilyPad projects use conductive thread to complete electrical circuits. The following sections will introduce you to some basic sewing techniques as well as a few special pointers for using conductive thread to build working circuits. Even if you're already familiar with using a needle and thread, this section may still be useful to you, specifically where it pertains to sewing with LilyPad parts.



Parts of a LilyPad Circuit

Securing Your Components

Each LilyPad piece has large holes with conductive silver pads called sew tabs. These tabs are designed to give you plenty of room to pass a needle and thread through the hole several times. Before you begin stitching your circuit, identify the sew tabs you would like to connect, and orient them so they are easily accessible in your design. If following along with SparkFun templates, the pieces will have a specific location on the design for both ease of sewing and visual appeal.

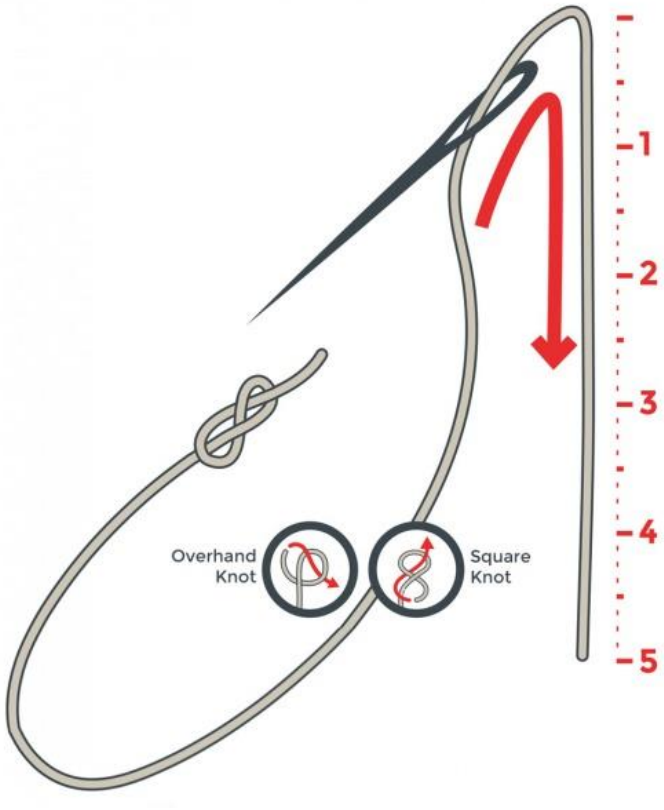


We recommend using a small dot of hot glue (preferred) or fabric glue to attach each LilyPad piece to the fabric to keep it from moving while you sew. Make sure not to accidentally seal up the holes in the sew tabs.

To help plan where the stitches will go, you can use a marker to draw lines between the components.

Threading a Needle

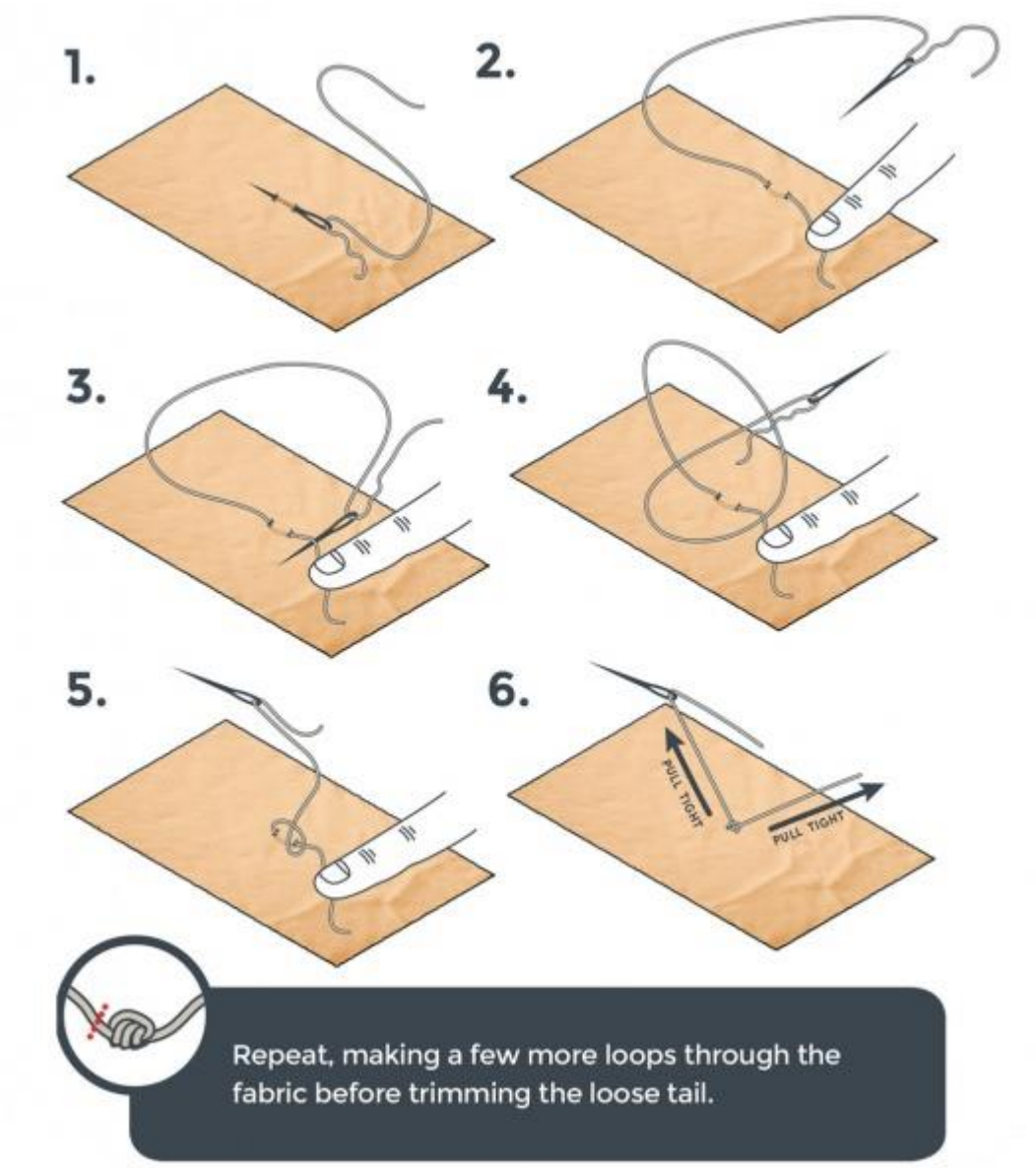
Cut a piece of conductive thread approximately 2 feet long. Push one end of the thread through the eye (opening) of the needle and pull through, leaving a tail of about 5 inches.



Before you begin sewing your project, you will need to tie a knot at the long end of the thread to prevent you from completely pulling it through the fabric. You can tie a simple overhand or square knot. The next sections will explain a few other knot methods.

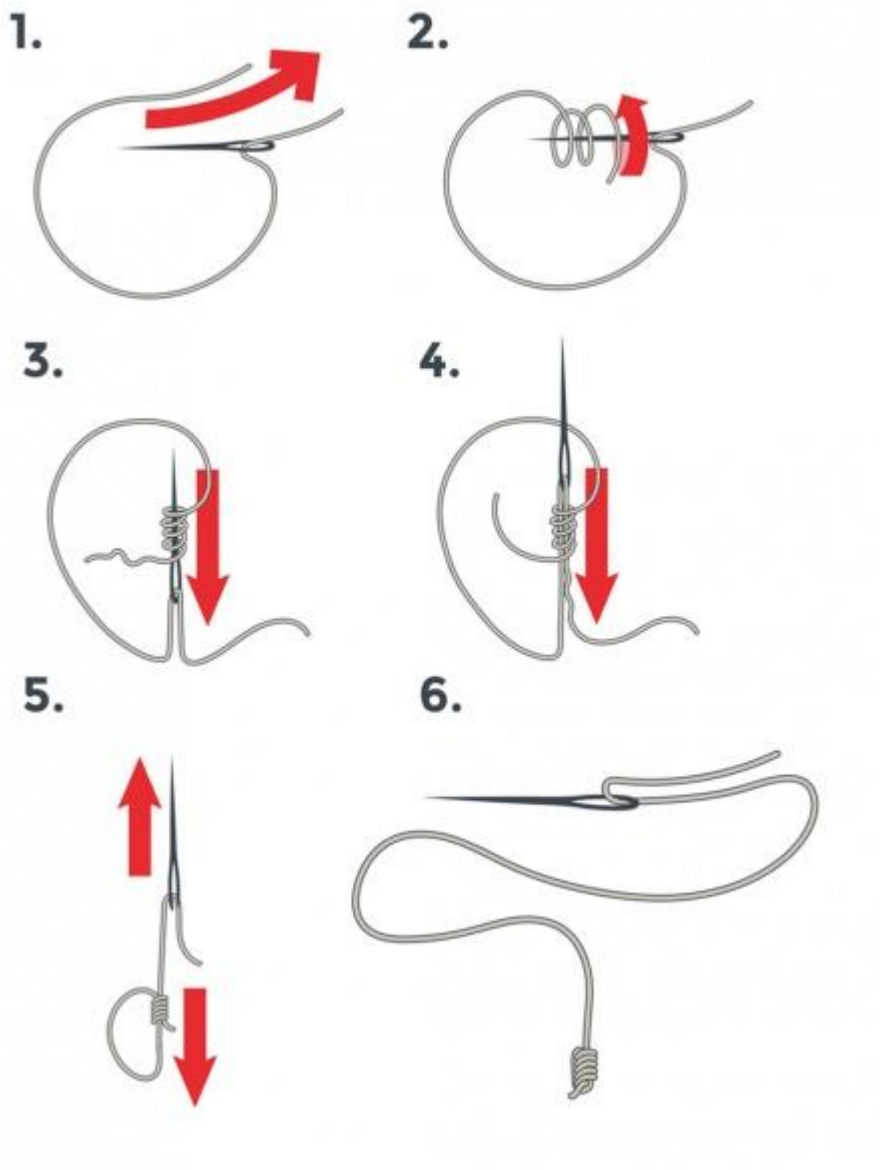
Starter Knot

A starter knot is a method of starting your stitch with a knot directly on your fabric.



Quilter's Knot

The slightly more advanced quilter's knot is a way to tie a quick, secure knot on the thread. After some practice, this knot can be tied very quickly.

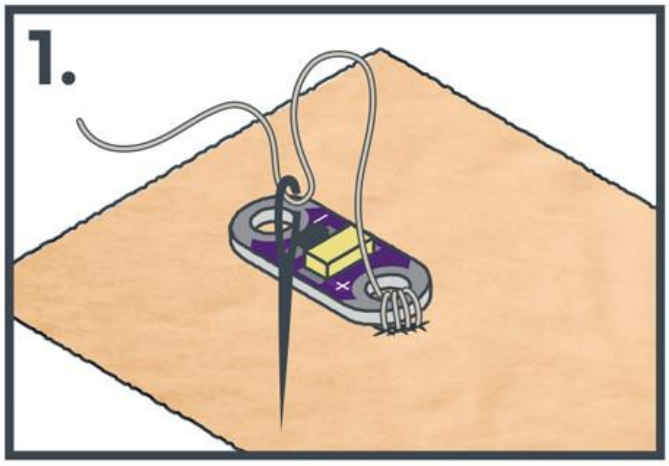


NOTE: Always remove your battery when working on your project to avoid damaging your components.

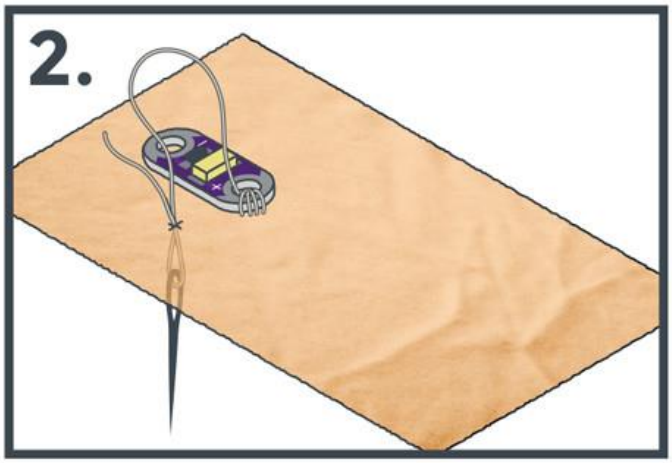
Sewing Basics

After sewing loops around a sew tab, a running stitch will enable you to connect LilyPad pieces together with a continuous length of conductive thread. Follow these steps:

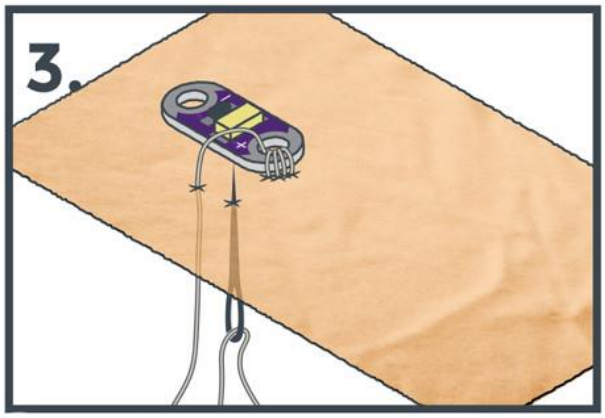
Push the needle through the fabric about ¼" in the direction of your stitch path.



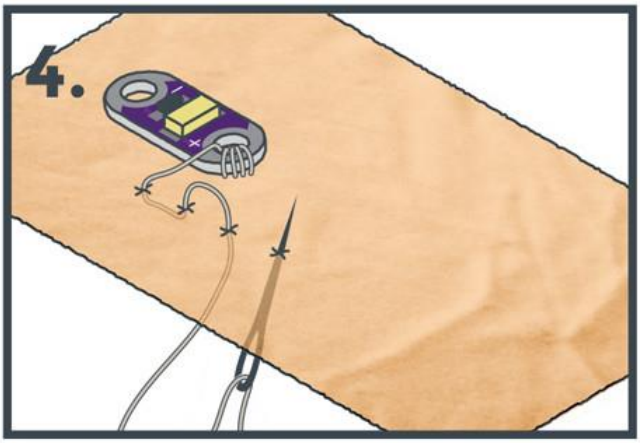
Pull the slack of the thread through so it sits flush with the fabric.



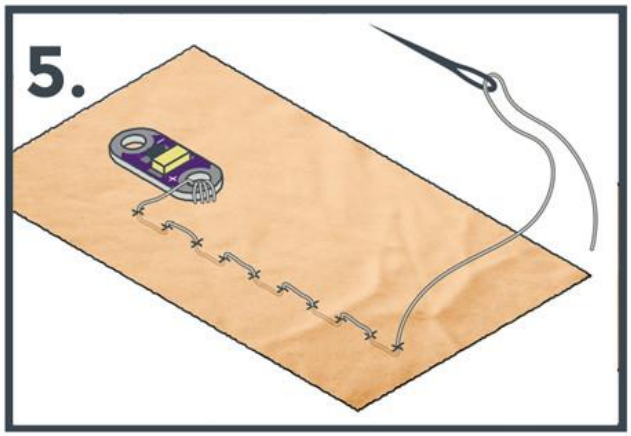
Push the needle back up through the fabric another ¼" along the stitch path.



Pull the slack of the thread through so it sits flush with the fabric.

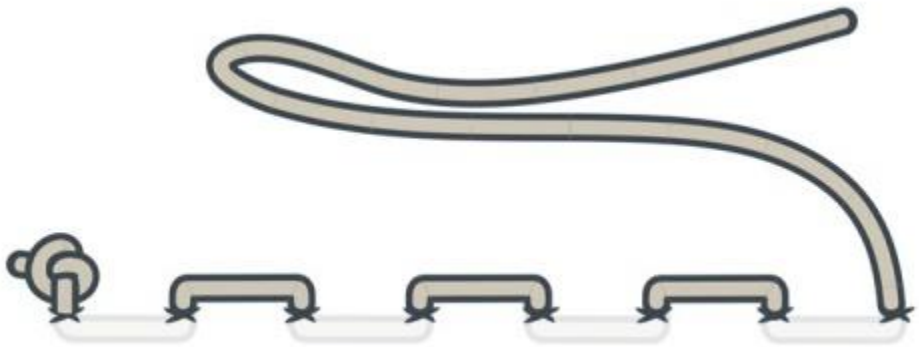


Repeat this process to travel along the path to the next LilyPad piece you want to connect to, keeping stitches evenly spaced

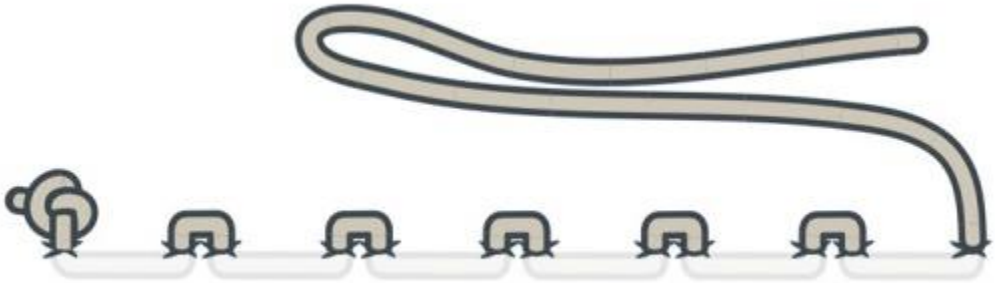


Running vs. Hidden Stitch

In a basic running stitch, the stitching will be even on both sides of the fabric.



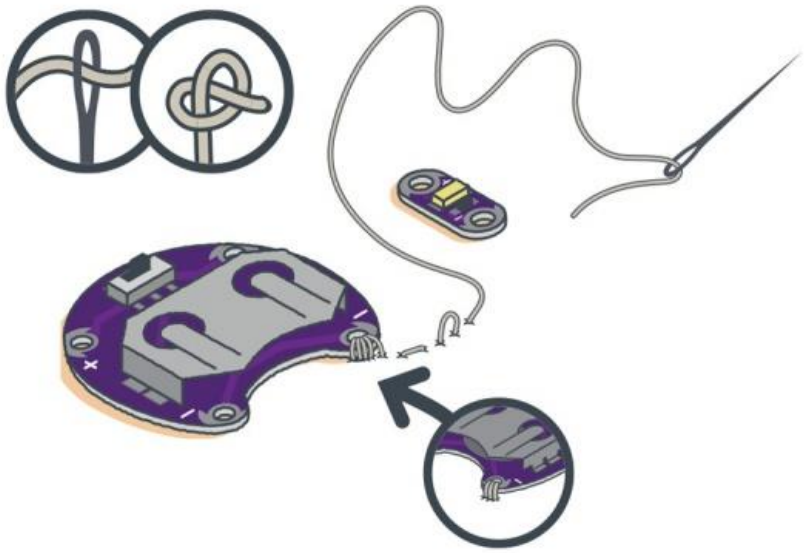
To hide the stitches so that they are not seen on the outside of the project, make a longer stitch on the back of the project and a very small stitch on the front of the project. This method is called a “hidden stitch.”



As you sew, flip your fabric over every so often to make sure the conductive thread isn’t getting knotted or tangled. If you are just starting out with sewing, your stitching may take some practice before it feels comfortable or easy. Remember to be patient with yourself and take your time while stitching. If your thread breaks, you can stitch onto existing conductive thread to continue the electrical connection.

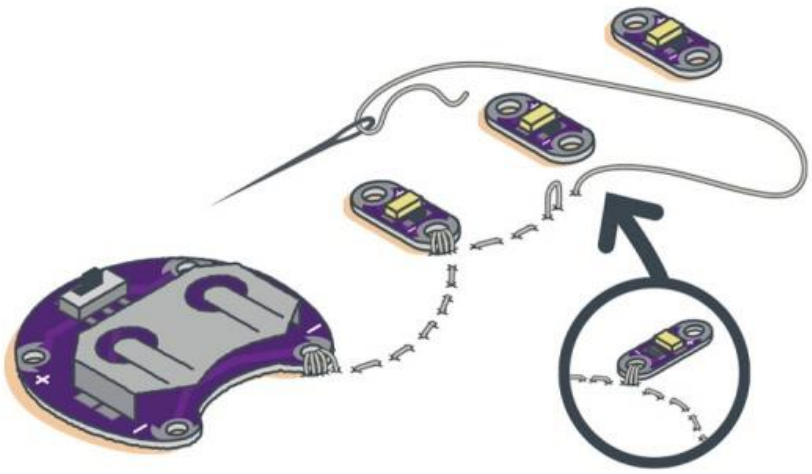
Connecting LilyPad Pieces

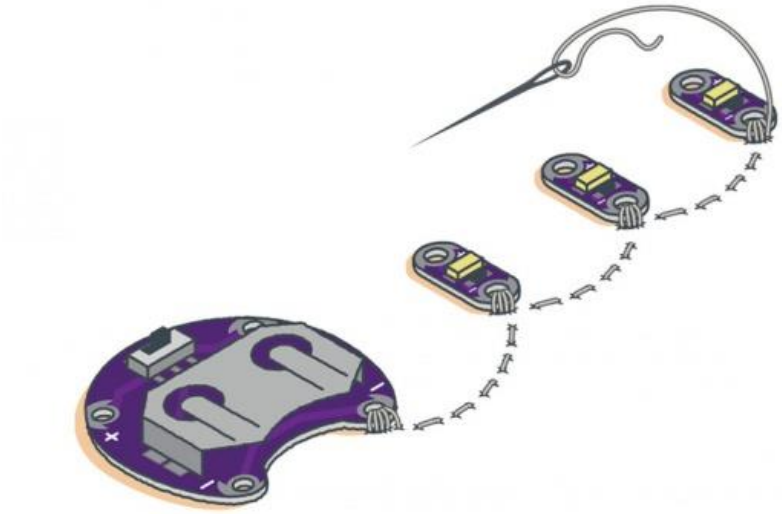
Both running and hidden stitches will enable you to connect LilyPad components together with a single length of conductive thread. To connect two LilyPad pieces, continue stitching after completing three to four loops around the sew tab.



Connecting Multiple LilyPad Pieces

To connect more than two LilyPad pieces, instead of trimming your thread and starting over, continue stitching to the next piece, make three to four loops, and repeat as necessary. There is no need to use a new length of thread if the pieces will share a connection.





Finishing Your Connection

When you have completed connecting components, use a finishing knot. Thread tails can cause electrical shorts, so be sure to trim your thread afterward.